



**THE  
AGRICULTURAL LEDGER.**

**1898—No. 14.**

---

**COAL.**

**(INDIAN COAL.)**

**(DICTIONARY OF ECONOMIC PRODUCTS, Vol. II., C. 1414-41.)**

---

**REPORT ON THE COAL SUPPLY OF INDIA.**

*Including results of the Examination of Selected Samples from the Principal  
Seams. (With Appendix containing Tables of Results.) By PROFESSOR  
WYNDHAM R. DUNSTAN, M.A., F.R.S., Director of the Scientific Department  
of the Imperial Institute, London.*

---

*Other PAPERS that may be consulted :*

**Imperial Institute Hand-book No. 9. Indian Coal.**

**The Agricultural Ledger No. 2 of 1895.**



**CALCUTTA:  
OFFICE OF THE SUPERINTENDENT, GOVERNMENT PRINTING, INDIA.  
1898.**

**Price 6 annas or 6d.**

**The objects of THE AGRICULTURAL LEDGER are :—**

- (1) To provide information connected with agriculture or with economic products in a form which will admit of its ready transfer to ledgers ;
- (2) To secure the maintenance of uniform ledgers (on the plan of the Dictionary) in all offices concerned in agricultural subjects throughout India, so that references to ledger entries made in any report or publication may be readily utilised in all offices where ledgers are kept ;
- (3) To admit of the circulation, in convenient form, of information on any subject connected with agriculture or economic products to officials or other persons interested therein ;
- (4) To secure a connection between all papers of interest published on subjects relating to economic products and the official Dictionary of Economic Products. With this object the information published in these Ledgers will uniformly be given under the name and number of the Dictionary article which they more especially amplify. When the subject dealt with has not been taken up in the Dictionary, the position it very possibly would occupy in future issues of that work will be assigned to it.

(*Mineral and Metallurgical Series, No. 11.*)

# THE AGRICULTURAL LEDGER.

1898—No. 14.

—♦—  
COAL.

(INDIAN COAL.)

[ *Dictionary of Economic Products, Vol. II., C. 1414-41.* ]

## REPORT ON THE COAL SUPPLY OF INDIA.

*Including results of the Examination of Selected Samples from the Principal Seams. (With Appendix containing Tables of Results.) By PROFESSOR WYNHAM R. DUNSTAN, M.A., F.R.S., Director of the Scientific Department of the Imperial Institute, London.*

The valuable and interesting report by Professor W. R. Dunstan, F.R.S., reproduced in these pages may be fittingly preceded by the following brief account of the manner in which the present inquiry originated.

In 1895 Sir F. A. Abel, Bart. K.C.B., Secretary and Director, Imperial Institute, forwarded to the Government of India in the Revenue and Agricultural Department a report upon the specimens of coal transmitted by the Department for exhibition in the Indian Section of the Imperial Institute and for the purposes of examination. The report included the results of the technical examination in the Research Department of the Institute of the whole of the samples and of the elementary analyses of those which were shown by that examination to be of superior quality.

In Sir F. A. Abel's letter on the subject, Flying Seal Series No. 41, dated 7th March, the following paragraph occurs :—

"In no instance was the sample received sufficiently large to permit of practical experiments, with a view to the determination of the calorific value, etc. Should experiments of this kind be desired in any particular instance, they can be carried out in the Research Department, provided one or two cwts. of the coal to be thus examined is forwarded."

PRELIMINARY  
NOTE.

Conf. p. 2.

C-1414-41.

COAL.	Report on the
<b>PRELIMINARY NOTE.</b>	<p>On the case being transferred to the Reporter on Economic Products for further action, those firms who had previously supplied samples, and others were invited to furnish about two cwts. of coal from their respective collieries for ascertaining the calorific value and chemical composition. A reminder was subsequently issued to the Managers and Proprietors of the collieries which had not responded to the original circular pointing out that the collection of samples already to hand was of so representative a character that it seemed undesirable that any collieries should be omitted.</p> <p>The second larger series of samples now reported on form the result of that correspondence.</p> <p>It may be mentioned here that out of 43 companies and individuals addressed, 28 furnished samples, and only 17 either did not reply (12) or declined to avail themselves of the offer placed before them (5).</p> <p>It may also be well to explain that the numbers quoted in Table II., column 1, and there described as Indian Invoice numbers are in reality the Indian Museum Registration numbers. Smaller duplicates of the samples furnished to the Imperial Institute were in every case retained in the Indian Museum both for purposes of verification and in accordance with the standing rule which provides that for every specimen despatched to the Imperial Institute an exact duplicate shall be retained in the Indian Museum. The advantages of this procedure are obvious. A London firm is thus enabled to communicate with its Calcutta correspondent, or <i>vice versa</i>, referring him to a sample exhibited in both the Imperial Institute and the Indian Museum under one and the same registration number.</p> <p>It need only be remarked that the Director's report on the coal supply of India together with the table of analytical results are printed in their entirety. The portion of the appendix containing the diagrammatic arrangement of the chemical analyses and the specially prepared map of India are not, however, reproduced. The only addition is that made to Table I. where the statement giving the outturn of the collieries for 1896 is brought up to date by inserting the official returns for 1897.</p> <p style="text-align: center;"><b>Introductory.</b></p> <p>At the instance of the Government of India an examination has been made in the Scientific Department of the Imperial Institute of</p> <p><b>C. 141441.</b></p>

Conf. pp. 22.  
24 of 1897.

Conf. p. 21.

Coal Supply of India. (W. R. Dunstan.)	COAL.
<p>a number of large samples of coal taken from some of the principal seams in India, many of which have not been previously examined. The coals were collected under the supervision of Dr. George Watt, G.I.E., the Reporter of Economic Products to the Indian Government. Two series of samples have been received. The first series formed the subject of a report from the Scientific Department in 1895, which has been printed in the Indian "Agricultural Ledger," No. 2, of that year (<i>see also</i> "Imperial Institute Journal," Vol. 1, No. 4, p. 162, and "Annual Report of the Indian Committee of the Imperial Institute," India Office, 1897). The results of the analysis of this first and smaller series are, for convenience of reference, included in the table appended to this Report, being marked by an asterisk. The second, larger, and more representative series forms the chief subject of the present Report.</p>	<p>INTRODUCTION.</p> <p>CONF. p. 2.</p> <p>CONF. pp. 22, 23 &amp; seq.</p>
<p><b>Literature.</b></p> <p>In addition to the Report above-mentioned, the following works are of importance in connection with the history, occurrence, distribution, production, composition, and characteristics of Indian coal:—"Memoirs of the Geological Survey of India," 1871-97, papers by T. W. H. Hughes, F. R. Mallet, W. King, F. Noetting, T. De la Touche, P. N. Bose, etc.; Ball's "Geology of India," Vol. III., 1881; Watt's "Dictionary of the Economic Products of India," article "Coal," by Dr. W. Saisse, Manager of the East Indian Railway Collieries; "The Karharbari Coalfield, with some remarks on Indian Coals," by Dr. W. Saisse; "Proceedings of the North of England Institute of Mining and Mechanical Engineers," 1880; "Annual Review of Mineral Production in India" for 1896 by Dr. George Watt, G.I.E., Calcutta, 1897; "Imperial Institute Series of Hand-books of Indian Commercial Products, No. 9, Indian Coal," Calcutta, and Imperial Institute, London, 1893.</p> <p>It will be convenient to briefly summarise here the chief points in connection with the occurrence, distribution, production and characters of Indian coal.</p>	<p>Bibliography of Indian Coal.</p>
<p><b>Occurrence.</b></p> <p>From the exhaustive investigations made by the Geological Survey of India, it appears that the Indian coal measures belong, not like those in England and Wales, to the carboniferous period,</p>	<p>AGE OF INDIAN COAL MEASURES.</p> <p>C. 1214-41.</p>

COAL.	Report on the
<b>NOTE.</b>	<p>but chiefly to the upper palaeozoic and lower jurassic formations. The coal occurring in the Peninsula, south of the Indo-Gangetic plains, belongs to the lower Gondwana period, whilst the extra-peninsular coal, e.g., that of Assam and Upper Burma, is principally cretaceous and tertiary. This difference in the occurrence of coal in India and Great Britain is important in accounting for many of the peculiarities in the composition and characters of Indian coal as compared with English and Welsh coal.</p>
Exploration of Indian coal-fields not complete.	<p style="text-align: center;"><b>Distribution.</b></p> <p>Coal is widely distributed throughout India, except in Bombay and Sind, the North-West Provinces and Oudh, Rajputana, and Mysore, where the mineral is either scantily distributed or entirely absent. Many of the coal-fields have not been fully explored and only a small proportion of the total known coal area is at present worked. The seams in Bengal and Assam are frequently from 50 and 80, to as much as 180, feet in thickness. The pits are often of considerable depth; at present the deepest appears to be about 700 feet. In many cases the working of the seams leads to the escape of little or no fire-damp, so that the miners are able to work with naked lights. In 1895, 235 collieries were at work, but in 1896 only 172 were in active operation. At the present time Bengal produces more than three-fourths of the coal mined in India. The localities and extent of the local production in India may be learned from the following summary, taken from the last published returns (1895 and 1896). The chief coal localities are figured (roughly to scale) in the map* which is appended to this Report. This map is one prepared for the "Hand-book" at the instance of the Indian Government in 1892. The principal railways, which are marked, are important in connection with the question of transport.</p>
Frequent absence of fire-damp. Conf. p. 10.	<p><b>ASSAM.</b>—The mines in Dufia, Khasi and Jaintia Hills, the latter including the Cherrapunji mines, the Garo and Naga Hills, and the district of Lakhimpur, in which the extensive mines of Makum occur, are of considerable importance in relation to the railway extension in this Province. The thick seams of the Makum mines are being actively worked, and are estimated to furnish 18,000,000</p>
Over three-fourths Indian Coal furnished by Bengal.	
Assam Coal Mines.	

\* Not reproduced.—Ed.

Coal Supply of India. (W. R. Dunstan.)	COAL.
<p>1895. In 1895, the production amounted to 172,717 tons; in 1896, to 177,359 tons. In these mines the boring is usually made horizontally into the hillside instead of by a vertical shaft.</p>	<p>DISTRIBUTION. Assam Mines Output.</p>
<p><b>BALUCHISTAN.</b>—This Province produced 23,359 tons of coal in 1895, but only 10,572 tons in 1896, the chief mines being those of Khoist and Quetta. Much of the coal is too friable to be of general use.</p>	<p>Baluchistan Coal mines.</p>
<p><b>BENGAL.</b>—In 1895 there were 218 collieries at work, producing 2,716,155 tons; in 1896, 154 collieries were worked, producing 3,037,920 tons, valued at Rs1,46,411. The principal fields are:—<i>Karharbari</i> (200 miles from Calcutta), covering 8 square miles and estimated to contain 136 million tons; <i>Raniganj-Barakar</i> (about 130 miles from Calcutta), covering at least 500 square miles, and representing 14 thousand million tons; <i>Jheria</i>, a few miles to the west of Raniganj, covering 200 square miles, and representing 465 million tons; <i>Bokaro</i>, close to the Jheria field, which covers 220 square miles in thick seams estimated to contain 1,500 million tons; <i>North Karanpura</i>, which occupies 472 square miles, representing 8,750 million tons; <i>South Karanpura</i>, which represents about 75 million tons; <i>Daltonganj</i>, covering 200 square miles, and representing about 11 million tons; <i>Bamgarh</i>, a small field, south of Bokaro, occupying 40 square miles and representing about 5 million tons. Other fields, at present not largely drawn upon, are <i>Talchir</i>, <i>Rajmahal</i>, and <i>Darjeeling</i>, where there is a narrow field of graphitic coal.</p>	<p>Bengal Coal Mines.</p>
<p><b>BURMA.</b>—The most important fields are the <i>Thingadaw</i> on the Irrawaddy, and those on the banks of the Chindwin river near Kalewa. The output of coal in Burma amounted to 17,239 tons in 1895, and to 22,993 tons in 1896.</p>	<p>Burma Coal Mines.</p>
<p><b>CENTRAL INDIA.</b>—In 1895, Central India produced 98,219 tons of coal; in 1896, 115,386 tons. The most important field, and the only one systematically worked, is that of <i>Umaria</i> in Rewah, which is only 34 miles from the Katni station on the East Indian Railway, and is therefore of great importance as a source of supply for the North-West Provinces and the Panjab. The Umaria field covers 3 square miles, and is computed to contain 28 million tons of coal. Other fields are those of <i>Sohagpur</i>, close to Umaria, covering 1,600 square miles; <i>Korar</i>, 9 square miles, and <i>Barampur</i>, 400 square miles.</p>	<p>Central India Coal Mines.</p>



## COAL.

## Report on the

**Summary-  
Table.**  
General  
Provinces  
Coal Mines.

**Hyderabad  
Deccan  
Coal Mines.**

**Madras  
Coal Mines.**

**Panjab  
Coal Mines.**

Warora, C. P.

**CENTRAL PROVINCES.**—In 1895 the Central Provinces produced 122,776 tons of coal, but in previous years the amount was far greater. In 1896 it rose again to 141,185 tons. The principal mines are those of *Machpant*, on the Great Indian Peninsula Railway, about 100 miles to the south-west of Jabalpur, and *Warora*; the latter, which belongs to the Government, is responsible for the increased production of 1896. Other mines are those of *Shahpur* and *Pench*, *Korba*, *Mand*, and *Bangarh*; the three latter, which are in the Mahanadi valley, cover over 1,000 square miles and include several seams of great thickness.

**HYDERABAD.**—The most important mine in Southern India is the *Singareni*, in the Dominion of the Nizam. The output in 1895 was 298,915 tons; in 1896, 262,681 tons; most of it went to Madras and Bombay. The Singareni coal is of especial interest as being at present the nearest to the large deposits of iron ore of the Salem district, some of which is of excellent quality (see Annual Report of the Indian Committee of the Imperial Institute, India Office, 1897). Little is at present known of the large coal-fields of *Kamarum*, *Cherla*, *Chinnur*, *Madaravaram*, and *Boddanam*.

**MADRAS.**—The principal mines are the *Rajahmumpalli* of the *Godavari* coal-fields, but they are scarcely yet in full working order. It seems probable, from the occurrence of both coal and iron ore in Madras, that before long an important iron smelting industry will be established in this Province.

**PANJAB.**—The *Dandot* mines of the Jhelum district contain three seams about three feet thick. In 1895 they produced 72,143 tons, which were chiefly consumed on the North-Western India Railway; in 1896 the production had risen to 79,017 tons. Other fields are those of *Fidh*, *Bhaganwalla*, *Chitapanhar*, *Haseru*, and *Bannu*, which, however, have not been fully explored.

### *Mode of Working; Labour.*

For detailed information as to coal mining, coal companies, coal legislation and coal labour, reference must be made to the "Imperial Institute Hand-book on Indian Coal." The following accounts of mining in Bengal may be included here as indicative of the mode and conditions of Indian labour.

"The system of working varies very much. At Warora, Central Provinces, where 100,000 tons per annum are wound by direct

Coal Supply of India.

(W. R. Dunstan.)

COAL.

acting engines out of two shafts 300 feet deep, the system nearly approaches the English. No women work underground, and work is constant from Monday morning to Saturday night. The work time is divided into three shifts of eight hours each. The seams, which vary from 8 to 12 feet, are worked thus:—Galleries or boards and headways are driven 12 feet wide, and 6 feet in height, leaving the roof coal and pillars 40 feet square. The coal is so hard that it has to be nicked and undercut, and then blasted down. The pillars are worked by splitting each from one headway or another, and then taking the far end off in slice. The roof coal comes with it.

"At the Mohpani collieries a similar system is worked. The difficulties met with in these mines, owing to the faulted and disturbed nature of strata, are probably unequalled in India.

"The Karharbari coal-field is mainly worked by three companies, the Raniganj Coal Association, the Bengal Coal Company, and the East Indian Railway. The system here is similar to that obtaining all over Bengal. The working hours are from 6 A.M. to 6 P.M., and, perhaps, later, when extra work is required. Only four days a week real work is done, and the consequence is that collieries must have a far greater number of working places than the same output in England would warrant. All the miner's family work with him, carrying or training his coal. Picks of English pattern and make are now universal, the crowbar and single pick having been ousted. The workings are on the bord and pillar system. Pillars vary from 12 feet to 40 feet square and 40 feet by 60 feet. In the shallow mines and thin seams (7 to 8 feet) the former size obtains; in the thick seams (from 12 to 20 feet) the latter. Pillars are worked in the 8-foot seam in the following manner:—A 4-foot chock is placed between each pillar in the row of pillars (generally six in number) that are to come out. A chock is also placed in front of each; the pillar is then attacked from the front side. When pillars are taken out, the chocks are withdrawn and the roof falls.

"The remarks on the Raniganj coal-field given below apply in some measure to this field. Of sinking, coal cutting, the miner's love of holiday, lighting of mines, etc., the description in one case is a description in the other. Payments in this coal-field are weekly, on Sunday mornings, the miners resorting from the pay offices to the East Indian Railway bazar, which was established to attract local

MOSE  
WORKING:  
LABOUR.  
Wages,  
C.P.

Mohpani.

System  
pursued in  
Bengal.  
Karharbari.

# *The Agricultural*

COAL.	Report on the
<p><b>Notes</b>  <b>Working:</b>  <b>LABOUR.</b>  <b>Systems</b>  <b>prevailed in</b>  <b>Bengal.</b></p>	<p>labour, and which has done so. The labourers consist of low class Mussulmans and Hindus, as also aborigines,—Santals and Kols. There are some Bauris, brought from Bengal to teach the local men how to cut coal. The local men, however, cut coal better, as they have discarded the Bauri <i>sebel</i>. Local labour is more tractable, and the Bauris are not in such requisition as formerly.</p>
<p><b>Drainage.</b></p>	<p>“Drainage is effectively carried out by Tangye's special and lifting and forcing pumps, worked by bob-levers from horizontal engines. The machinery is of good type, and winding and hauling are done by good engines. Ventilation is attended to in the deep mines, mainly by furnaces or steam-jets.</p>
<p><b>Miners' dwellings.</b></p>	<p>“The miners live in small villages, aggregations of huts of mud walls of bricks set in mud with thatched or tiled roof. The hut consists of one room, sometimes two, of from 6 feet by 6 feet to 10 feet by 10 feet in size. Those better off have cow-sheds and granaries; these two latter with the dwelling forming three sides of a quadrangle. The larger proportion of the labourers cultivate during the rainy season, and work at the collieries only in the cold season, say from October to June. Some of the labourers have settled down to coal cutting as a calling, and these work constantly, always excepting Monday, which is invariably a holiday.</p>
<p><b>Wages paid to miners.</b></p>	<p>“Coal cutting is paid for by contract at so much a tram or bucket. These are of various sizes. The price generally amounts to from 7 to 8 annas per ton for large, and <math>1\frac{1}{2}</math> to <math>1\frac{3}{4}</math> annas per ton for small coal. All other work as stone cutting, sinking, rail-laying, etc., is paid for by daily wages.</p>
<p><b>Classes of coal.</b></p>	<p>“The coal is hand-picked into four kinds. Steam is larger than 2-inch cube, rubble larger than <math>\frac{3}{4}</math>-inch cube, smithy down to <math>\frac{1}{2}</math>-inch cube, and all smaller than that is called slack or dust. This picking or screening is done by contract, and for rubble and smithy the coolies get about 4 annas per ton. Slack is not paid for. Loading is done by hand into the railway wagons. At the mines tipplers are used for discharging the coal from underground trams into the wagons that run in the narrow-gauge tramways.”</p>
<p><b>Raniganj.</b></p>	<p>The following notes on the Raniganj coal-field are by Mr. T. H. Ward:—</p> <p>• “The Chord line, East Indian Railway, passes across this coal-field, and the collieries are clustered on either side and along the Barakar branch, sidings and branches, up to six miles in length</p> <p>C. 1414-41.</p>

Coal Supply of India.	(W. R. Dunstan.)	COAL.
<p>built by private enterprise, connect most of the collieries to the main line. Here winding engines, wire-rope guides, and tipplers, and the regular paraphernalia of an English colliery are fast supplanting the primitive 'gin' and bucket of a few years ago. These gins were (and sometimes are still) turned by women, 25 to 30 being employed on each gin. They kept time to a monotonous chant which they sang as they tramped round and round. The sinking in the district is easy, through soft sandstones, no brickwork being required to protect the sides. Heavy water is sometimes met with.</p> <p>"The coal in the east of the field is very strong and non-caking. The sandstone roof is also very strong, and comes right down into the coal. Practically no timber is required in working the coal in the manner described below. In the west of the field, at Sanctoria for instance, the coal is not so strong, though the roof is everywhere the same. From Belrooi near Sitarampur, westwards, the seams worked are all coking coals.</p> <p>"The seams worked are seldom less than 10 feet and sometimes reach 11 feet, in thickness. In the Barakar Coal Company's Kumar-dubbi Colliery and the Bengal Coal Company's Liakdee Colliery on the west of the Barakar, the enormous thickness of upwards of 80 feet has been found.</p> <p>"The mine is laid out underground on the same plan throughout the district. This plan has been stereotyped all over the field, and is adopted without reference to its suitability to the different conditions obtaining in the various seams worked. Indeed, it has been adopted apparently more with reference to the prejudices of the native miner than from economical considerations. Galleries are excavated to the full height of the seams 12 feet to 16 feet wide, leaving square pillars of varying sizes to support the roof, many acres being thus often left on pillars. The native cooly insists (and he has his own way very much in this coal-field) on commencing operations at the roof and working downwards until the full height of the seam has been excavated. His chief and dearly-prized weapon is a 'sabal' or crowbar with sharp point at one end. With this he smashes the coal, standing always when at work. He never groves beyond the first 'cleat.' Gangs of four or five men occupy each gallery. They are paid by the bucket or tram of steam coal or small delivered at the pit bottom. If any timber has to be set</p>		<p><b>MODE OF WORKING: LABOUR.</b> Systems pursued in Central, Eastern.</p> <p><b>Thickness of seams.</b></p> <p><b>Plan.</b></p> <p><b>Galleries.</b></p> <p><b>Usual mining implement.</b></p>

COAL.	Report on the
<b>Mine.</b> <b>Working:</b> <b>Liakdee.</b> <b>System</b> <b>worked in</b> <b>Western</b> <b>Bengal.</b>	<p>up in a working place, a man of the carpenter caste ('Chamar') who is paid a daily wage, must be sent for the purpose.</p> <p>" Women and children work underground, and are principally employed in carrying the small coal and dust. They are also paid by the tram or bucket. The women often take their babies, two and three months old, down the mine, taking with them also a small cot on which the child sleeps or plays while its parents are at work.</p> <p>" Access to the mines is very generally by inclines opening to the surface.</p>
<b>Seams.</b>	<p>" In the eastern part of the district the seams are for the most part flat, in the central and western parts the strata are often steep (the general dip being southerly), and intrusions (dykes) of trap rock become more frequent. The deepest shafts are about 150 feet, the largest part of the coal yet won being from much less depths. Some fire-damp has been met with in the western part of the district. Chanch Colliery (west of the Barakar), belonging to the Bengal Coal Company, was abandoned some years ago after an explosion in which several men were burnt, some of whom died. At Sanctoria, also belonging to the Bengal Coal Company, some men were burnt in 1883.</p>
<b>Shafts.</b>	
<b>Fire-damp.</b> <i>Conf. p. 4.</i>	
<b>Principal coal-cutting or mining caste.</b>	<p>" The collieries of Kumardubhi and Liakdee have already been mentioned. Thousands of tons of coal have been won from the outcrops merely of these magnificent seams, and thousands of tons still remain to be worked without indenting on their resources at any greater depth.</p>
<b>Custom of the district to pay wages daily.</b>	<p>" The 'Bauri' is the principal caste which supplies coal-cutters for the district. In some respects the Bauri colliers' characteristics are amusing, like those of his western prototype. He is very fond of getting drunk, especially at the week ends, and very disinclined to go to work on Mondays. He is good tempered and improvident; it is a difficult matter to persuade him although he is always paid a 'ticca' (contract) rate for his work and could easily increase his earnings, to do more than will, with his wife's contributions, keep the household in rice and himself in drink for the day. The nearly universal and very bad custom in this district is to pay each evening for the work done during the day. The collier or cooly has often to wait about until 8 or 9 p.m. for his money. He then goes cheerfully home, and remains up half the night drinking and singing with his companions (he is very social in his habits), incompre-</p>

Coal Supply of India. (W. R. Dunstan.)

COAL.

heavily happy with his tuneless tom-tom. In the morning he trudges back, very often seven or eight miles (a distance of course travelled twice a day) to work and is down the pit at 9 or 10 A.M. All day, in the intervals of work, he sucks the comforting hubble-bubble.\*

"The light which the collier carries with him is exceedingly primitive. He gets an allowance of oil in proportion to the number of trams of coal he cuts. Every morning he draws at the godown sufficient for his requirements during the day with an allowance of cotton thread or old rags to serve for wick. This oil he burns in a 'chiragh,' or small piece of stone hollowed out into the shape of a boat (a piece of tile from the roof of his house is often substituted). In this he places a small quantity of oil and a portion of wick. Any oil he can save from his allowance is his perquisite, and he can carry it home. *Mahad* and castor oil are the chief oils used. Some of the mines are lighted by kerosene, burnt in small tin lamps holding about two ounces, with small circular wicks. The native does not like this plan so well, as he cannot use it to rub on his body or to season his food, a purpose for which *mahad* oil is used.

"The ventilation of the underground workings receives very little attention, and in most collieries none at all. The great freedom from fire-damp, and the lofty seams exploited, have kept this question in the background. The ignorant native has not yet realised that his health and longevity are in question, and he has besides helped much to prevent ventilation becoming a necessity, by the wonderful power of endurance he has shown, and which enables him to work for hours at the bottom of a sinking shaft with water pouring over his naked body, or to work all day long, or day after day in driving a 'rise' gallery, perhaps hundreds of feet from any current, in an atmosphere which is fetid and laden with steam. This is a blot on the mining of the district and ought to be speedily removed.

Production.

The increase in recent years of coal production in India is very remarkable. In 1895 it amounted to no less than 3,537,820 tons valued at Rs. 28,81,352. This is nearly half as much again as that for 1894, and an increase of more than 50 per cent. as

HOPE  
WORKING:  
LABOUR.  
System  
pursued in  
Bengal.  
Siam, etc.

Allowance of  
oil for  
lighting  
purposes.

Kinds of oil  
employed.

Ventilation.

Great staying  
powers of  
native  
miner.

Conf. Table I,  
Appendix,  
p. 82.

\* Syn. for native hooka or pipe.—Ed.

COAL.	Report on the
<b>PRODUCTION.</b>	<p>compared with the average for the three previous years. In 1896, the quantity was greater still, 3,848,013 tons. These figures would seem to be a trustworthy indication of an increase in the general commercial and industrial prosperity of India, since the amount consumed for domestic purposes is inappreciable, nearly the entire quantity being consumed in steamships, railways, and factories. The average price of Bengal coal is Rs 2 per ton at the pit's mouth. Picked coal sells at from Rs 3 to Rs 4 a ton.</p>
<b>Prices.</b>	<p>The output for 1896 [and 1897] of the principal collieries is given in a Table appended to this Report. (Table I.)</p>
<b>Conf. p. 21.</b>	<p><b>Imports and Exports.</b></p>
<b>Marked decline in imports.</b>	<p>The imports of coal from foreign countries into India in 1894-95 amounted to 808,713 tons, more than three-fourths of which were taken by Bombay. In 1895-96 the imports fell to 746,850 tons.* Nearly the whole of the foreign coal is derived from the United Kingdom; Australia, and, in a smaller degree, Japan are among the countries whose exports of coal to India show a considerable advance, although together their output is less than one-twentieth of that of the United Kingdom. The statistics of the last few years show that India is relying more and more on her own fields as a source of supply, the increase in the amount of coal imported being small as compared with the enormous advance in the amount produced internally. It may be safely concluded that the complete cessation of foreign imports of coal is only a matter of time.</p>
<b>Foreign Coal whence received.</b>	<p>With regard to the export of coal from India; in 1895, 53,565 tons, representing a value of Rs 5,00,226, left the country; in 1896, the exports reached 79,989 tons.† Nearly the whole of this went to Ceylon, not for internal use, but to meet the large demand for steam traffic at Colombo. Ceylon now obtains from India what she formerly took from Europe, and chiefly from the United Kingdom. It is stated that complaints have been recently made that Bengal coal is too "dirty", to be suitable for use by the Ceylon Railways. This is a difficulty which ought to be easily overcome, for there is plenty of suitable locomotive coal in Bengal.</p>
<b>Indian Coal, whether exported.</b>	<p><b>Chemical Examination.</b></p> <p>The chemical examination of the various samples of Indian coal has been confined, in the first instance, to those points which are of</p>

\* Corresponding figures for 1896-97 481,036 tons.

† " " " " " 133,478 "

Coal Supply of India. (W. R. Dunstan.)

COAL.

importance in determining the general quality of each coal, and in indicating the particular purposes for which it is suitable. In certain cases these data have been supplemented by ultimate analysis (combustion) for the determination of carbon and hydrogen. The constituents which have been determined are: *fixed carbon*, perhaps the most significant datum not only in reference to the value of the coal as such, but also as affecting the quality of the coke (*i. e.*, fixed carbon and ash) obtainable from it; *ash*, or mineral matter, a high percentage of which is characteristic of an inferior coal; *volatile matter*, including bituminous constituents, gas and water; *sulphur*, a large proportion of which is objectionable for most of the purposes for which coal is employed, and especially for the smelting of iron.

In addition to the foregoing constituents, an approximate determination has been made of the heat-producing power of the principal coals by ascertaining the *thermal value* or *calorific equivalent*. The general characters and caking quality of each coal have also been recorded.

*Methods of Examination.*

For purposes of reference the following particulars of the methods employed are given:—

*Sampling.*—Pieces of several pounds weight were sawn from the large blocks, weighing from  $\frac{1}{2}$ —1 cwt. in most cases, which formed the specimens, and these were completely broken up and averaged. The specimens generally, as received, were stated to be fairly representative of the seams from which they were taken.

*Technical analysis.*—The percentages of fixed carbon, volatile matter, sulphur and ash were determined under the following conditions:—

About 0.5 gram of the finely-powdered coal was weighed out into a tared platinum crucible; the latter was supported 12 inches above the working bench, and heated over a No. 8 Fletcher-Bunsen burner, working at full power for two minutes; it was then immediately subjected to a blow-pipe flame for two minutes longer, being kept at a bright red heat. After cooling in a desiccator it was weighed and the loss reckoned as volatile matter, which, of course, included moisture. The well-fitting lid of the crucible was not removed during the whole of this process. In the case of caking coals a very small

CHEMICAL  
EXAMINATION.

Component  
parts.

Calorific  
value.

Manner of  
sampling.

Fixed carbon,  
volatile  
matter, ash,  
how determined.

C. 1414-41.



COAL.	Report on the
<p><b>REPORT OF</b> <b>ANALYSIS.</b></p>	<p>quantity of soot sometimes remained on the under side of the lid and escaped combustion. These determinations were made in duplicate, and passed if the difference was not more than 0.3 to 0.4 per cent. at this stage. The crucible was then put into a muffle furnace with the lid half off, and heated until nothing but ash remained, when it was cooled in the desiccator and weighed. The loss was reckoned as fixed carbon, and the residue as ash; the colour of the ash will be found recorded in the tables.</p>
<p><b>Determina- tion of sulphur.</b></p>	<p>For the estimation of the sulphur about 1.5 grams of coal were fused in a platinum dish, with 30 grams of the following fusion-mixture:—Sodium-chloride, 4 parts; potassium nitrate, 3 parts; sodium carbonate (dry), 1 part. The mixture was slowly heated, and, after a short time, it deflagrated and became liquid; when cool it solidified into a white cake, which was dissolved in boiling water; the solution was filtered, acidified with hydrochloric acid, and, while quite hot, precipitated with barium chloride. By keeping the beaker and its contents warm on the water-bath for three or four hours, the precipitate of barium sulphate was obtained in a granular form very suitable for filtering. Most of the filtering was done through a felt of asbestos placed in the bottom of a perforated platinum crucible, with the help of a water pump; this being a modification of Gooch's method. Careful test-experiments showed that, in point of accuracy, this method was at least equal to that ordinarily used, <i>vis.</i>, igniting the precipitate of barium sulphate in a crucible; it is for speed much to be preferred. These estimations were made in duplicate, a difference of 0.3 per cent. being considered quite allowable after considerable experience. In some cases the sulphur left in the coke was estimated.</p>
<p><b>Drying.</b></p>	<p><i>Ultimate analysis.</i>—This was conducted on selected coals in the usual manner. The coals were first dried in a current of hydrogen gas at 120° C. for half-an-hour; this was done by pushing the platinum boat containing the weighed quantity of coal into the centre of a long piece of wide glass tubing, which itself was passed through the walls of a saucepan. Hydrogen was led in at one end and allowed to diffuse through a small piece of fine tubing packed with cotton wool, inserted in a cork at the other end. A burner was lighted under the saucepan, and a thermometer fixed into a hole in the lid; a very convenient air-bath was thus obtained. The coal.</p>

Coal Supply of India. (W. R. Dunstan.)	COAL.
<p>after being dried, was then burned in the usual way in a piece of hard glass tubing. The tube used was filled to a length of 15 inches with copper oxide (from wire), and to the extent of 4½ inches with lead chromate, these materials being kept in position by plugs of fine copper gauze. The total length of the tube was about 34 inches. It will be noticed that the amount of ash, as determined in the combustion, was in some cases distinctly higher than when estimated by the technical method. This is doubtless due to the presence of iron and other mineral substances in the ash, which are left in a higher state of oxidation after being heated in oxygen.</p>	<p>ULTIMATE ANALYSIS.</p>
<p>The <i>Calorific Equivalent</i> has been determined by means of Thompson's calorimeter, the apparatus being previously standardised by the combustion of material of known calorific value and the necessary correction applied to the experimental numbers. The results are stated in large calories.</p>	<p>Ash.</p>
<p>The services rendered in connection with the experimental work by Dr. F. Löhn, Special Assistant Chemist in the Scientific Department, and by Mr. A. M. Crighton, Junior Assistant Chemist, merit official record.</p>	<p>Thermal or calorific value.</p>
<p><i>Results.</i></p>	<p>Acknowledgment of services.</p>
<p>The results obtained in this examination are given in the tables appended to this Report, the various samples of coal being arranged under the provinces from which they were obtained (Table II.). For convenience of comparison, and also to render possible a general survey of the figures, they have been plotted in curves on the diagram* which is appended. A table of previous analyses of Indian coals is also given, to which is added, for comparison, analyses of typical British coals (Table III.). To those familiar with the technical valuation of coal the data need little explanation or comment. It will be seen at once that Indian coal varies much in composition and quality. Most of it is quite suitable for ordinary purposes, whilst some of the samples, e.g., certain of those from Bengal and Central India, are of excellent quality, equal to that of some of the best British coals. It may be useful to draw attention to the characteristics of the coal of each district.</p>	<p>Conf. pp. 18, 23 et seq. Conf. p. 26 to end.</p>
<p><b>ASSAM.</b>—The coal from <i>Makum</i> is regarded as one of the best of the Indian steam coals, though this is scarcely borne out by the</p>	<p>Conf. p. 60.</p>
	<p>Variation in quality of Indian Coal.</p>
	<p>Makum.</p>

\* Not reproduced.—Ed.

COAL.	Report on the
<b>SINGUITS.</b> Assam Coal.	two samples now reported on. The ash is remarkably small, but the sulphur is high. Neither of the two samples examined contained the very high percentage of fixed carbon (75.7 per cent.) recorded by Mr. F. R. Mallet in his 'Memorandum on the Coal-fields of Assam' (1876), ( <i>see</i> Table III.). One of the samples gave a rather soft coke containing much sulphur, the other was non-caking.
Conf. p. 27.	
<b>Cherrapunji.</b>	The sample from <i>Cherrapunji</i> , though low in ash, contains much sulphur. It is, however, a hard caking coal, burning like cannel. The sample examined differs considerably from that reported on by Mr. James Prinsep ( <i>see</i> Table III.). An account of the Cherrapunji field has been given by Mr. T. De la Touche ('Records of the Geological Survey of India,'—Vol. 22, Part 3, 1884). The sample from <i>Maofong</i> is similar to the other Assam coals, but differs very much from the two samples analysed by Mr. F. R. Mallet ( <i>see</i> Table III., 'Records, Geological Survey of India,'—Vol. 2, 1875). The sample from the <i>Dikhu Valley</i> is a non-caking bituminous coal.
Conf. p. 26.	
<b>Maofong.</b> Conf. p. 27.	
<b>Dikhu Valley.</b>	
Noticeable spot regard- ing Assam Coals.	All the Assam coals are remarkable in being comparatively free from mineral constituents (ash). They are probably serviceable as steam coals, but the samples examined contain too much sulphur for use in iron-smelting.
<b>Khost.</b>	<b>BALUCHISTAN.</b> —The <i>Khost</i> coal is tertiary and somewhat bituminous. Of the two samples from the Khost colliery, that from the Khost seam is probably a serviceable caking steam coal, containing, however, a large proportion of sulphur. That from the <i>Killa-Hakim</i> seam contains little sulphur, and has the characters of a fair caking coal which furnishes more heat when burnt than would be anticipated from the analytical numbers.
<b>Killa-Hakim.</b>	
	<b>BENGAL.</b> —The coal in Bengal varies greatly in quality; much of it is excellent, the fixed carbon ranging between 50 and 60 per cent., and the calorific value exceeding 6,000 cal. (= about 10 British thermal units), whilst the ash often does not much exceed, and in some instances falls below, 10 per cent., and the sulphur is frequently present in but very small proportion. A great deal of the Bengal coal is serviceable steam coal. Many samples cake well and contain little sulphur, and the coke is therefore suitable for iron smelting.

Coal Supply of India. (W. R. Dunstan)		COAL.
The fifty-three samples of Bengal coal were derived from the following collieries :—		RESULTS. Bengal Coal.
Raniganj.	Sanctoria.	
Barakar.	Searsole.	
Kumardubhi.	Jemehiri.	
Rajpur.	Madhubpur.	
Loyabad.	Daltonganj.	
Petana.	Buggudeah in Jheria.	
Karharbari (Giridih).	Barmondia.	
Sodepur.	Luchipur.	
Liakdee.	Ghoosick.	
Nimcha.	Baratchak.	
Kooldeah.	Chatabad.	
Jeyramdangah.	Moulkara.	
Dhadka.	Nandi.	
Belrool.	Kalipahari.	
Borrea.	Kustore.	
Salanpur.	Patlabari.	
The analyses of <i>Karharbari</i> coal agree well with those published by Dr. Saiso (Table III.). From this coal a considerable quantity of coke is produced, at present chiefly in the Anchor rectangular oven, partly for locomotive service and partly for use in the East Indian Railway Company's foundry at Jamalpur.		Karharbari. Conf. p. 38.
The <i>Barakar</i> coal has the reputation of being a first-rate steam coal, and a certain quantity of coke containing very little sulphur is produced from it. <i>Sanctoria</i> coal is considered to be a good gas coal, so also is the <i>Giridih</i> coal, which is used by the Calcutta Gas Company.		Barakar.  Sanctoria. Giridih.
<b>BURMA.</b> —Only two samples have been received from the Burma Coal Company. The origin of the coal is not stated, but it is probably derived from the <i>Shwabo</i> district, about 60 miles above Mandalay and four, or five miles from the Irrawaddy. That from the roof of the seam is an inferior non-caking coal difficult to burn, so that its caloric equivalent could not be ascertained. That from the floor of the seam is valueless, being nearly incombustible and little better than shale.		Shwabo.
<b>CENTRAL INDIA.</b> —The <i>Umaria</i> Government Colliery in the Rewah district, from which all the samples came, produces coal		Umaria.

COAL.	Report on the
<b>BEHAR.</b> <i>General India Coal.</i> <i>Conf. p. 29.</i>	<p>of various qualities. None of it is first-rate or equal to the Bengal coal, the ash being high and the fixed carbon and the calorific equivalent small. The sulphur, however, is not excessive, and the picked coal may be serviceable for locomotive use and for some other purposes. It does not cake and therefore cannot furnish coke. None of the present samples are equal to that analysed by the Geological Survey in 1884 (Table III.).</p>
<b>Mohpani, Warora, Gadawarra.</b> <i>Conf. pp. 29.</i>	<p><b>CENTRAL PROVINCES.</b>—Four samples were received from <i>Mohpani</i>, six from <i>Warora</i>, and three from <i>Gadawarra</i>. The Mohpani samples, sent by the Nerbudda Coal and Iron Company, are non-caking coals of fair quality, the sulphur is small, but in two samples the ash is high. They are inferior to the sample of which an analysis is on record (Table III.).</p>
	<p>The samples sent from the Government Colliery of Warora are all non-caking coals resembling those from Mohpani; the fixed carbon is, however, usually lower and the sulphur higher. There is said to be excellent iron-ore and limestone in the Warora district, which might be worked if a caking coal could be found. At present nearly the whole of the output of the colliery is employed on the Great Indian Peninsula Railway with which the colliery is connected by a branch railway joining the main line at Wardah Junction, about 50 miles distant.</p>
<b>Hyderabad (Singareni).</b>	<p>The Gadawarra coal is somewhat similar in its proportion of fixed carbon. In two samples the ash is high but the sulphur low. This coal differs from that of Mohpani and Warora in caking well. The Gadawarra seam is not far from the Mohpani and close to the Gadawarra station on the Great Indian Peninsula Railway, about 80 miles from Jabalpur.</p>
	<p><b>NIZAM'S DOMINIONS.</b>—The two samples of coal from <i>Hyderabad</i> (Singareni) are of fair quality as steam coals. One does not cake, and the other only slightly. In one the sulphur is low, in the other rather high, and the same remark applies to the ash.</p>
<b>Dandot, Pidh, Baghanwalla, Shahrig.</b>	<p><b>MADRAS.</b>—No samples were received from this Province.</p>
	<p><b>PANJAB.</b>—The samples were obtained from <i>Dandot</i>, <i>Pidh</i>, <i>Baghanwalla</i>, and <i>Shahrig</i>. The Dandot sample is a good non-caking steam coal, with a relatively high calorific value, though low in fixed carbon. The Pidh is a similar but rather better non-caking steam coal with a somewhat high proportion of sulphur. The Baghanwalla is an inferior coal which cakes slightly. The</p>

Coal Supply of India. (W. R. Dunstan.)

COAL.

RESULTS.

Punjab Coal.

coal from the Takrai seam of the Shahrig district is a bituminous caking coal with a low percentage of fixed carbon but a relative high calorific value, depending on the presence of solid hydrocarbons. It is probably a serviceable but fast burning coal. One sample of shale from Fidh and another from Dandot were examined for mineral oil and gas. In both cases the result was unsatisfactory, neither specimen furnished any appreciable quantity of oil, whilst the Fidh shale produced rather more than one-half and the Dandot shale less than one-fourth of the quantity of gas obtained from good English coal, and the gas was of poor illuminating power.

The information contained in this Report as to the Coal Deposits of India, together with the results of the analyses of samples taken from some of the principal seams, will, it is hoped, be the means of directing attention to the possibilities of industrial enterprise which India offers through her enormous coal supply.

Samples of the coal referred to in this Report, and in some cases of the cokes furnished by them, may be seen in the Indian Collections of the Imperial Institute.\*

Conf. p. 2.

\* Duplicates may also be inspected at the Indian Museum, Economic and Art Section, Calcutta.—Ed.



Report on the Coal Supply of India.

COAL.

APPENDIX.

TABLE I.

Output of Indian Collieries in 1896 and 1897.

APPENDIX.  
Annual  
Production.

Provinces and Districts.	Name of Mines.	When opened.	By whom worked.	Output of Coal in	
				1896.	1897.
				Tons.	Tons.
Assam— Lakhimpur (Mishmish mine).	Titak . . . . .	1883	Joint Stock Company	177,159	184,371
	Lado Valley . . . . .			...	...
	Upper Lado . . . . .			...	...
	Triap . . . . .	1897	Assam Tea Company	95	931
	Namding . . . . .			...	...
Kulu Mide . . . . .	Dikhu Valley . . . . .	1854	...	...	320
	Gulabey Dalkhous . . . . .	1894	...	...	...
Total for Assam . . . . .				177,354	184,533
Baluchistan . . . . .	Khost . . . . .	1897	North-Western Rail- way.	...	...
	Shary . . . . .	1893		...	...
	Sor Range (Quetta) Coal Mine.	...		...	...
	Total for Baluchistan . . . . .				10,571
Bengal— Bardhaman . . . . .	Total production of Bardhaman District Collieries . . . . .			1,782,637	1,933,086
	Bakura . . . . .			14,972	9,813
	Total production of Bakura District Collieries . . . . .			660,910	660,605
	Total production of Hazaribagh District Collieries . . . . .			571,356	434,500
	Total production of Manbhum District Collieries . . . . .			1,640	1,879
	Total production of Santal Perguana District Collieries . . . . .			95	1,350
Total production of Bengal Collieries . . . . .				3,037,990	3,142,407
Burma— Shweta . . . . .	Lakkapin (Thingadaw).	1893	...	...	...
	Thaymye . . . . .	...		...	...
Total production of Burma Collieries . . . . .				23,403	11,471
Central India— Barrack . . . . .	Umaria . . . . .	1884	Government . . . . .	115,385	134,778
	...	...		...	...
Total for Central India . . . . .				115,385	134,778
Central Provinces— Bilaspur . . . . .	Mahpani . . . . .	1883	Joint Stock Company	10,548	10,975
	Warra . . . . .	1871		131,643	111,654
	Total production of Central Provinces Collieries . . . . .			141,185	122,629
Madras— Salem . . . . .	Sigaram . . . . .	1887	Joint Stock Company	203,681	203,550
	Rajahmampalli . . . . .	...		1,737*	...
Punjab— Jullundur . . . . .	Dandot . . . . .	1886	North-Western Rail- way.	70,017	70,647
	Pith . . . . .	...		...	...
	Baghanwalla . . . . .	1893		6,137*	12,145

Note.—The figures of output for 1897 being now to hand, it has been thought desirable to add them to the foregoing table.—E.E.

\* 1896.

C. 1414-41.



# The Agricultural

COAL

Report on the

Imports

Tabulated Results

TABLE

Tabulated Results of

Indian Import Number.	Import Number.	Date.	Mine.	Whence received.	Remarks made in forwarding sheets.
ASSAM.					
*1808	3030	4th Oct. 1894.	Mahum .	Assam Railway and Trading Company (Loh Valley).	—
6053	7080	11th Jan. 1895.	Do. .	Assam Railway and Trading Company, Limited.	1 cwt. Mahum and
*90	1445	4th Oct. 1894	Cherrapunji	Cherrapunji Coal-field.	—
*97	1446	Do. .	Machong .	Machong Coal-field .	—
8093	7770	29th Nov. 1894	Dikha Valley .	Dikha Valley Colliery, Nasim, Assam.	—
BALUCHISTAN.					
*93	1440	4th Oct. 1894	Khoat Colliery	Khoat Colliery, Khoat seam.	—
*94	1441	Do. .	Do. .	Khoat Colliery, Killa Nasim seam.	—
BENGAL.					
*99	1448	Do. .	Kumardubhi .	Barakar Coal Company, Kumardubhi Colliery.	—
7065	7311	13th July 1894	Do. .	Barakar Coal Company	One box of steam coal from Kumardubhi Colliery.
*1001	8005	4th Oct. 1894.	Raniganj	Bengal Coal Company, Limited, Raniganj coal.	—
7094	7454	29th July 1894.	Do. .	A. Whyte, Esq., Raniganj.	Coal from the mine of Chowrah, 4 miles east of Tapani Railway Station on the East Indian Railway, and belonging to the Raniganj series.

G. 1414-41.

Coal Supply of India.

COAL.

B.

Examination of Indian Coals.

APPENDIX.  
Tabulated Results.

Calcutta Value.	Fixed Carbon per cent.	Ash per cent.	Coke per cent.	Volatile matter per cent.	Sulphur per cent.	Caking Properties.	Colour of Ash.	Other Characteristics of the Coal.
800	87.50	1.00	54.30	45.45	1.07	Does not cake.	Fair chocolate.	A glistening black coal, clean to handle, easy to break, conchoidal fracture.
700	87.50	1.00	54.30	45.45	4.20	Cakes . .	Reddish brown.	Very dirty and dusty coal, breaks readily with irregular fracture, alternately dull and bright.
700	87.50	4.70	54.30	45.70	3.60	Do. . .	Dark red .	A dull black coal, dirty, very hard, with cuboidal fracture.
700	87.70	1.90	52.75	47.25	3.08	Do. . .	Yellowish brown.	Bright and clean with fossil veins in many places.
800	81.00	1.30	52.75	46.25	3.45	Does not cake.	Dark reddish brown.	A very bright coal black as pitch, and of conchoidal fracture; intersected with dull layers, and thin layers of a clayish mass.
600	87.50	5.10	54.75	45.97	4.30	Cakes . .	Terra-cotta .	Clean, bright and hard but disintegrating with a white efflorescence, and with evolution of sulphuretted hydrogen.
600	81.30	9.30	51.00	48.00	0.74	Do. . .	Yellowish brown.	Clean, bright and hard, with obtuse fracture.
600	81.00	13.80	65.35	44.07	0.53	Do. . .	Grey . .	Layers of dull and bright coal, clean rounded fracture.
600	81.30	14.30	60.30	33.70	0.60	Do. . .	Dove . .	Dull, with bright patches, fairly tough and clean.
600	87.00	12.30	54.00	48.00	1.58	Do. . .	Fawn . .	Bright, hard and dirty.
800	87.30	12.15	60.74	38.30	1.47	Does not cake.	Light fawn .	Dull, with bright patches, rather tough, clean .

**COAL.**

**Report on the**

**REFERENCE.**  
Specimens  
forwarded.

**TABLE**

Indian Number.	Imperial Number.	Date.	Mine.	Whence received.	Remarks made in forwarding sample.
<b>BENGAL—contd.</b>					
7900	7485	19th July 1896	Raniganj	A. Whyte, Esq., Raniganj.	Coal from the village Khosovera belonging to Pandra Estate, situated 3 miles S.W. of Barakar and belongs to the Lower Barakar series. In this case a band of a few very dark and carbonaceous clay divides the seam into two, the top coal is 5 feet 6 inches in thickness, of bright appearance, the bottom coal is 4 feet 4 inches in thickness and is a heavier and duller looking coal.
8184	7758	15th Nov. 1896	Raghunath Chuk.	Jagmuth Coal Company, Raniganj.	Raghunath Chuk coal.
9853	1990	14th Oct. 1894.	Barakar	Barakar Iron Works.	—
7347	9000	18th Mar. 1896	Do.	New Barakar Coal Company, through G. Alexander, Esq.	Coal taken from an incline just being opened out, situated three miles from Barakar on the Jharia Branch Railway. Taken from about 30 feet below the surface.
7740	7333	15th June 1896	Rajpur	Manager, Rajpur Coal Company, Barakar.	Coal from Rajpur Colliery, as usually obtained.
7760	7317	20th June 1896	Petana	Messrs. Mylne & Co., Proprietors, Petana Colliery, Barakar.	Petana steam coal.
7858	7313	13th July 1896	Loyabed	Manager, Barakar Coal Company.	Steam coal from Loyabed Colliery.
7860	7312	Do.	Do.	Do. do.	Do. (A special part which was roughly oxidized.)
9850	1986	11th Oct. 1894	Karharbari	East Indian Railway, Karharbari Colliery, Joghiland seam.	—

**Q 1414-45**

# Ledger.

## Coal Supply of India.

## COAL.

IL—contd.

APPENDIX.  
Tabulated Results.

Calorific Value, Gross Calories per cwt.	Ash per cent.	Calorific Value per cwt.	Volatiles per cent.	Sulphur per cent.	Caking Pro- portion.	Colour of Ash.	Other Characteristics of the Coal.	
29'00	11'95	70'00	20'00	1'70	Cakes . .	Dirty fawn .	A dull silky coal with bright patches, breaks easily, clean.	
28'00	14'97	60'00	40'00	0'04	Does not cake.	Greyish pink .	Alternate layers of bright and dull coal, dirty, breaks easily with much dust.	
29'00	15'47	18'35	71'80	20'18	0'50	Cakes . .	Greyish white .	Dull black, dirty, very hard.
24'00	21'00	20'25	71'05	20'90	0'80	Do. . .	Dirty white .	Dull black coal with bright patches in places, cleaves occa- sionally with a silky fracture, clean.
23'00	15'00	18'05	74'00	20'00	0'47	Does not cake	Do. . .	A dull coal with bright patches, fairly tough, conchoidal fracture.
24'00	14'30	10'40	64'80	25'10	0'80	Cakes . .	Do. . .	Glistening coal com- posed of dull and bright portion, former tough, the latter readi- ly broken. Occurs in well-defined layers.
23'00	20'54	13'00	73'50	20'40	0'87	Do. . .	Light grey .	Exhibits a peculiar curved fracture. Part of the sample was of dull appear- ance and very tough, while the remainder was bright and broke readily into small fragments.
24'00	15'00	15'30	74'35	25'75	0'91	Do. . .	Do. . .	
24'00	10'45	10'37	67'20	30'70	0'51	Do. . .	White . .	Laminated, very clean, cleaves in small cubes.

• C. 1414-41.

# The Agricultural

COKE.		Report de 1910				
APPENDIX.		TABLE				
Indian Number.	Imperial Number.	Date.	Mine.	Where received.	Remarks made to forwarding Sample.	
BENGAL—contd.						
9930	1983	6th Oct. 1894.	Karharbari	East Indian Railway, Karharbari Colliery, Lower seam.	—	
9941	1985	Do.	Do.	East Indian Railway, Karharbari Upper seam.	—	
7044	7081	31st Jan. 1896.	Do.	Manager, Giridih Colliery Limited.	(Karharbari Lower Seam) from Pt. Fehridih, Giridih Coal-field.	
6917	7070	6th Jan. 1896	Giridih	Superintendent, Bengal Coal Limited.	Steam coal, Giridih	
91698	1866	4th Oct. 1894	Sodapora	Bengal Coal Company, Limited.	Sodapora coal	
91699	1863	Do.	Likhda	Do. do.	Likhda coal	
91699	1864	Do.	Nimcha	Do. do.	Nimcha coal	
91699	1865	Do.	Koodnah	Do. do.	Koodnah coal	
8081	7453	11th Aug. 1896	Jayramdangah.	Managing Agent, New Bartholomew Company,	Coal from Jayramdangah, new seam.	
8082	7448	Do.	Dhadka	Do. do.	Coal from Dhadka, 1st seam.	
8083	7451	Do.	Betroot	Do. do.	Coal from Betroot	
8084	7453	Do.	Borren	Do. do.	Coal from Borren, fourth seam.	
7194	7007	20th Mar. 1896	Do.	Managing Agent, Borren Coal Company	Salempur coal	
91693	1867	4th Oct. 1894	Sanctoria	Bengal Coal Company, Limited.	Coal from Durhaga, Sanctoria.	
7891	7331	16th July 1896	Searsole	Searsole and Jemshiri Collieries, Searsole, Rajbati.	Searsole steam coal	
7852	7330	Do.	Jemshiri	Do. do.	Jemshiri coal	
91694	1868	4th Oct. 1894	Madhubpur	Bengal Coal Company, Limited.	Madhubpur coal	

C-1414-41. =

Coal Supply of India.

COAL.

II—contd.

APPENDIX

Tableland  
Borealis

Colours Value.	Fixed Carbon per cent.	Vol. per cent.	Calor. per cent.	Vol. per cent.	Sulphur per cent.	Caking Pro- perties.	Colour of Ash.	Other Characteristics of the Coal.
65a	44.50	7.20	75.12	17.25	0.40	Does not cake	Dark yellow	Dull black, clean, not very hard.
65b	40.50	5.20	75.10	17.25	0.40	Do.	Yellowish brown.	Dull black, hard, clean, breaks into cubes.
65c	38.50	14.50	75.10	17.25	0.40	Cakes	Dark	Dull, rather tough, breaks in every direc- tion with little dust.
70a	40.50	0.70	70.90	19.00	0.45	Do.	Buff	Clean, but rather dusty, crumbles readily, bright in layers.
80a	40.50	5.40	68.40	11.50	0.30	Do.	Light yellow	Bright, dirty, fairly hard.
80b	37.50	5.40	68.30	11.00	0.35	Do.	White	Mixed dull black and glossy, the latter crum- bles readily, clean.
80c	17.50	14.50	57.10	17.25	0.30	Do.	Brownish yellow.	Dull and glossy laminar, clean and hard.
80d	44.50	10.00	70.20	16.75	1.50	Do.	White	A dull black coal, clean and hard.
80e	14.50	10.00	60.00	16.00	0.70	Does not cake	Terra-cotta	Alternate dull and bright layers breaks easily in small frag- ments, clean.
80f	47.50	0.00	57.50	11.00	0.30	Cakes	Flesh colour	Alternate bright and dull layers, breaks easily in small frag- ments with little dust, clean.
70d	34.50	0.00	60.70	10.00	0.30	Do.	Do.	Dull with many bright patches, clean.
65d	38.50	10.30	68.20	17.00	0.05	Do.	Dirty pink	Dull, with bright patches, breaks easily in layers, clean.
60c	57.50	14.50	72.17	17.25	0.75	Do.	Grey white	Dull silty coal with glistening layers and patches. Hard and brittle, very clean.
65e	40.50	11.20	66.70	16.30	1.00	Do.	Lemon yellow	A glossy coal, hard, but with soft patches.
65f	44.50	0.00	55.10	16.20	0.30	Do.	Fawn	Alternate layers of dull and bright coal, clean, easily broken, cleaving in layers.
65g	44.50	10.00	55.30	14.50	0.20	Do.	Terra-cotta	Alternate layers of dull and bright coal, hard, dusty when broken.
60d	38.50	17.20	55.00	14.00	1.50	Do.	Brownish yellow.	A dull coal, laminated, hard, with soft patches, clean.

C. 1414-41.

# The Agricultural

COAL.		Report on the			
APPENDIX.		TABLE			
Indian Number.	Imported Number.	Date.	Mine.	Whence received.	Remarks made in forwarding Sample.
BENGAL—contd.					
7066	4072	24th Oct. 1896	Sanctaria	Bengal Coal Company, Limited.	Sanctaria coal
7066	286	Do.	Seemote	Do. do.	Coal from Seemote, Raniganj.
7143	7090	26th Mar. 1896	Daitongra	Dr. Sales, through Station Master, Gyn.	Daitongra coal, Raghuram.
7268	7360	28th Mar. 1896	Jheria	Bengal-Nagpur Coal Company, Limited, through George Alexander, Esq.	Coal taken from Jheria at Buggoodah in Jheria.
7340	7101	Do.	Do.	Do. do.	Coal taken from a quarry at Buggoodah. These two samples are not only surface coal, but have been exposed to the atmosphere for some months.
7861	7343	13th July 1896	Barmunda	Managing Agent, Damuda Coal Company.	Coal from Barmunda Colliery.
7863	7318	Do.	Luchipar	Do. do.	Coal from Luchipar Colliery.
7863	7318	Do.	Ghoosick	Do. do.	Coal from Ghoosick Colliery.
7864	7316	Do.	Bharatshah	Do. do.	Coal from Bharatshah or Damuda Colliery.
8192	7768	25th Nov. 1896	Chattabed	Katra-Jheria Coal Company, Limited, Katra-Manikam.	Chattabed, No. 13 seam.
8193	7770	Do.	Moolkara	Do. do.	Moolkara, East Colliery, No. 13 seam.
8194	7769	Do.	Do.	Do. do.	Moolkara, South Colliery, No. 14 seam.
8195	7771	Do.	Do.	Do. do.	Moolkara, West Colliery, No. 15 seam.
8195	7772	Do.	Chaitodee	Do. do.	Chaitodee, No. 15 seam.

C. 1414-41.

## Coal Supply of India.

## COAL.

11—contd.

## APPENDIX.

Tabulated Results.

Calorific Value.	Fixed Carbon per cent.	Ash per cent.	Coal per cent.	Volatiles matter per cent.	Sulphur per cent.	Caking Properties.	Colour of Ash.	Other Characteristics of the Coal.
6250	48.75	10.75	60.00	38.75	1.73	Cakes . .	Yellowish grey.	A dull coal with bright patches, hard and clean.
6260	47.75	11.00	56.75	41.75	1.51	Do. . .	Fawn . .	A clean bright coal, cleaving in layers.
6280	50.25	14.00	70.25	43.50	0.90	Does not cake.	Yellowish brown.	Bright coal, rather hard, not very dirty, on some pieces a small amount of white deposit.
6100	50.25	17.25	70.25	45.75	0.90	Cakes . .	White . .	Bright glistening coal, brittle and hard, in places, has a patchy appearance.
6300	54.25	14.00	70.25	51.25	0.70	Do. . .	Light grey .	Dull black coal with bright patches in places, cleaves occasionally with a silky fracture, rather hard, fairly clean.
6000	48.50	9.50	57.45	40.35	0.33	Do. . .	Cream . .	Clean, bright coal, easily broken, hard, but with soft patches.
6000	47.75	15.00	61.75	38.25	0.40	Do. . .	Fawn . .	In well-defined layers, part dull and part bright and glistening, clean, fairly tough, except that the bright layers crumble readily.
6050	45.00	11.00	53.50	44.15	0.095	Do. . .	Light fawn .	Well-defined layers of dull and bright coal, the former tough, the latter rather brittle.
6100	47.00	10.25	57.00	41.00	0.78	Do. . .	Fawn . .	Bright coal, fractures readily. Made up of a dull and bright portion. Dull portion tough, whilst the bright is readily broken.
6100	46.17	11.25	72.25	36.45	0.46	Do. . .	Greyish red .	A clean, rather bright coal, easily broken.
6095	46.00	10.50	72.25	36.80	0.03	Do. . .	Dirty white .	Laminated bright coal, dirty, breaks very easily with much dust.
6095	50.00	14.25	72.25	40.75	0.83	Do. . .	Do. . .	Dull coal with bright layers, clean.
6200	50.00	12.15	71.75	38.25	0.71	Do. . .	Reddish grey .	Bright coal in layers, clean.
6090	46.25	11.00	71.75	37.30	0.93	Do. . .	Dirty white .	Bright coal in layers, breaks easily, clean.

\*C. 1414-41.



## COAL.

## Report on the

## APPENDIX.

## Subsidiary

## TABLE

Indian Service Number.	Approved Institution Number.	Date.	Site.	Whence received.	Samples made in foregoing Sample.
BENGAL—contd.					
8297	7763	25th Nov. 1896	Hurdle .	Admiral Coal Company, Limited, Hurdle Colliery, Raniganj.	No. 1 sample . .
8196	7765	Do. .	Do. .	Do. do. .	No. 2 sample.
8199	7774	Do. .	Kalipahari .	Brikotopur Coal Company, Kalipahari.	Steam coal . . .
8266	7766	Do. .	Kestore .	Raniganj Coal Association, Limited.	Coal from Kestore Colliery, Jheria.
8261	7757	Do. .	Patnabari .	South Barakar Coal Company, Patnabari Colliery, No. 1 seam.	—
8290	7761	Do. .	Sibpur .	Katra-Jheria Coal Company, Limited, Choverpet, Agnash, East India Railway, Sibpur Colliery.	Large lump . . .
8292	7763	Do. .	Do. .	Do. do. .	Small pieces . .
8299	7769	Do. .	Kestore .	Raniganj Coal Association, Limited, & Fairlie Place, Calcutta.	Coal from Kestore Colliery, Jheria.
8293	8120	25th Feb. 1897	Kolkoeder .	Jheria Coal Company, Katras Collieries, Machhuan.	Kolkoeder, No. 12 seam.
BURMA.					
82831	6137	4th Oct. 1891.	Letkobbis .	Burma Coal Company, Limited.	From roof of seam
82832	6138	Do. .	Do. .	Do. do. .	From floor of seam
CENTRAL INDIA.					
8295	1603	Do. .	Umaria .	Umaria Colliery .	—
8295	1603	Do. .	Do. .	Do. .	—

## Coal Supply of India.

## COAL.

II.—Contd.

## APPENDIX.

Tabulated Results

Calorific Value.	Fixed Carbon per cent.	Ash per cent.	Coke per cent.	Volatiles matter per cent.	Sulphur per cent.	Caking Properties.	Colour of Ash.	Other Characteristics of the Coal.
808	87.80	7.20	67.40	20.70	0.40	Does not cake.	Fawn . .	Alternate bright and dull layers, the dull coal being dirty to handle.
800	87.20	6.70	69.20	20.90	0.37	Do. . .	Do. . .	Dull slaty coal with many bright patches, rather tough, clean.
800	87.90	10.40	29.20	47.77	0.34	Do. . .	Reddish grey .	A bright coal with some duller layers.
844	91.20	6.10	59.20	27.60	0.30	Cakes . .	Do. . .	Dull coal with bright layers, clean.
800	87.15	11.20	60.40	21.55	0.63	Do. . .	Do. . .	Dull coal with bright layers, easily broken with much dust, dirty to handle.
870	86.50	8.30	65.80	27.11	0.45	Does not cake.	Fawn . .	Alternate dull and bright layers, very dirty, breaks easily with much dust.
840	87.15	8.20	60.40	29.50	0.51	Do. . .	Light fawn .	Alternative dull and bright layers, breaks easily, clean.
800	87.70	8.30	71.20	27.71	0.61	Cakes . .	Reddish white.	Dull coal with graphitic lustre in oval pieces, and conchoidal fracture, breaks easily in layers with some dust, clean to handle.
840	88.20	15.00	70.10	23.87	0.85	Do. . .	Dirty white .	Rather bright coal with a silty lustre, breaks easily with some dust.
†	35.57	8.90	47.07	52.93	0.33	Does not cake.	White . .	Dull black, clean and hard with rounded surfaces and fracture.
†	7.90	28.30	†	26.00	0.11	Do. . .	Do. . .	Dull black, with glossy patches, very soft and soapy to touch, clean.
1200	88.40	23.60	83.20	26.70	0.30	Do. . .	Do. . .	A clean dull coal with irregular cleavage, easily broken.
540	50.80	20.00	62.57	17.43	0.43	Do. . .	Greyish white.	Dull, soft, clean, and contains fossilized roots.

† Does not burn readily.

C. 1414-41.

## COAL.

## Report on the

APPENDIX.  
Unworked  
Samples.

TABLE

Indian Number.	Imperial Number.	Date.	Mine.	Where received.	Remarks made in forwarding Sample.
CENTRAL INDIA—cont.					
7003	7001	15th Feb. 1896.	Umaria .	The Manager, Umaria Colliery.	Sample from No. 3 seam, Middle area.
7004	7002	Do.	Do.	Do. do.	Sample from No. 3 seam, Middle area.
7005	7003	Do.	Do.	Do. do.	Sample from No. 1 seam, Northern area.
7006	7004	Do.	Do.	Do. do.	Sample from No. 1 seam, Northern area.
7007	7005	22nd July 1896	Do.	Do. do.	Sample from No. 1 seam, Northern area.
7008	7006	Do.	Do.	Do. do.	Sample from No. 4 seam, Middle area. "Information required as to their caking pro- perties."
CENTRAL PROVINCES.					
8168	8651	4th Oct. 1894	Mohpani .	The North India Coal and Iron Company, Limited, Mohpani Coal Mine.	From No. 1 seam .
8164	7775	Do.	Do.	Do. do.	Sample A . . .
8165	7776	Do.	Do.	Do. do.	Sample B . . .
8166	7777	Do.	Do.	Do. do.	Sample C . . .
8118	1665	...	Warora .	Warora Colliery .	...
8118	1667	...	Do.	Do.	...
8120	7779	1st Sept. 1896	Do.	Manager, Colliery.	Warora From No. 2 pit .
8121	7780	Do.	Do.	Do. do.	From No. 4 pit .
8122	7780	Do.	Do.	Do. do.	From No. 5 pit .

C. 1414-41.

Coal Supply of India.

COAL.

H—contd.

APPENDIX.  
Tabulated Results.

Calcutta Value.	Fixed Carbon % air-d.	Ash per cent.	Calor. per cent.	Volatiles per cent.	Sulphur per cent.	Caking Properties.	Colour of Ash.	Other Characteristics of the Coal.
320	82.12	12.30	79.50	20.20	0.70	Does not cake.	White . .	Small quantities of white substance be- tween the layers to pieces. Rather dirty to handle.
321	80.00	12.17	79.80	20.17	1.00	Do.	Do. . .	Similar to page. Similar to page.
322	85.00	14.34	69.90	30.07	1.00	Do.	Do. . .	Similar to page. Traces of iron pyrites in cleav- ages, rather tough.
323	80.20	14.30	65.20	34.40	1.80	Do.	Do. . .	Similar to page and page, but not so dirty to handle. It also shows a silky patched appearance when cleaved.
324	82.00	21.00	64.00	35.31	1.80	Do.	Reddish white.	Tough coal of dull ap- pearance, cleaving in layers.
325	80.00	24.00	73.20	26.72	2.00	Do.	Dirty white	Dull, with small bright patches, irregular cleavage, easily broken, with much dust, dirty.
326	87.00	24.30	60.70	32.34	0.30	Do.	Brownish yellow.	Dull, laminated, very hard, fairly clean.
327	80.00	8.00	80.71	40.00	0.31	Do.	Light fawn .	A shaly coal, dull, with bright spots in layers, breaks easily, dirty, gives much dust.
328	80.00	8.33	80.00	31.00	0.40	Do.	Do.	A dull coal, very light, breaks easily, much dust, very fibrous.
329	80.00	11.00	62.74	37.20	1.00	Do.	Terra-cotta e	A dull coal with some bright layers, breaks easily with much dust, very dirty.
330	87.00	12.30	54.00	45.10	0.04	Do.	White . .	Dull, with bright patches, clean and rather soft.
331	80.00	11.70	53.70	46.15	1.01	Do.	Do. . .	A clean silky coal, easily broken, cleaving in cubes.
332	80.00	11.80	52.80	46.10	0.90	Do.	Grayish white.	Silky dull coal with some lighter patches, rather dirty.
333	87.12	13.00	50.00	41.00	2.20	Do.	Do.	Same as 332.
334	80.00	12.75	57.20	42.00	0.77	Do.	Dirty white .	Do.

C. 1414-41.

## COAL.

## Report on the

APPENDIX.  
Submitted  
Receipts.

## TABLE

Inventories Number.	Inventories Number.	Date.	Mine.	Whence received.	Remarks made in forwarding Receipt.
CENTRAL PROVINCES.—contd.					
8133	7773	1st Sept. 1896.	Warren .	Manager, Colliery Warren	From No. 1 seam, No. 1 pit.
* 1460	1063	4th Oct. 1896.	Mohpani .	Gadawana .	No. 2 seam . . .
* 1500	1064	Do. .	Do. .	Do. .	No. 3 seam . . .
* 1581	1065	Do. .	Do. .	Do. .	No. 4 seam . . .
NIZAM'S DOMINIONS.					
997	1425	...	Singareni .	Hyderabad .	—
7803	7308	...	Do. .	Agent and General Manager, Hyderabad (Deccan) Company.	Singareni coal . .
PANJAB.					
7070 and 7071 and 7072 and 7073	7083 and 7084 7085 and 7086	3rd Feb. 1896	Dandot .	Mining Manager, Col- liery District, North- Western Railway. Do. do.	Two boxes of Dandot steam coal.
		Do. .	Pidh .	Do. do.	Two boxes of Pidh steam coal. These are very friable and deteriorate rapidly if exposed to the air, and when in bulk are apt to set by spontaneous combus- tion.
7100 and 7110	7313 and 7314	15th Feb. 1896	Baghawalla .	Do. do.	Two boxes of Bagha- walla coal.
7118	7093	15th Feb. 1896.	Pidh .	Do. do.	Pidh shale. It is believed to contain mineral oil and is known to contain gas. Further information de- sired on these points.
7134	7086	15th Feb. .	Dandot .	Do. do.	Dandot shale, the same information desired as above (Pidh shale).
7080	7319	16th April 1896	Shahrig .	Executive Engineer, District, North-Western Rail- way.	Takrai top seam coal from Malwavy, West.

C. 1414-4F.

# Coal Supply of India.

COAL.

## APPENDIX.

Tabulated Results.

II—continued.

Calcutta Value.	Price per cent.	Ash per cent.	Calorific value per cent.	Volatilisation per cent.	Sulphur per cent.	Caking Properties.	Colour of Ash.	Other Characteristics of the Coal.
400	40'30	20'75	61'70	20'20	0'60	Does not cake.	Slightly yellow	Slaty dull coal with only a few bright spots, dirty, rather tough.
350	41'40	20'10	60'70	20'25	0'30	Cakes . .	White . .	Dirty, alternate layers of dull and very hard coal and bright coal, easily broken.
300	41'30	20'00	60'00	20'30	0'40	Do. . .	Yellowish brown.	
250	40'20	19'20	58'50	20'40	0'40	Do. . .	Light yellow .	
200	42'20	17'10	58'20	23'70	0'30	Does not cake.	Yellowish brown.	Dull, hard and clean with occasional glossy layers.
150	40'00	18'00	60'00	20'10	1'20	Cakes slightly.	Dark fawn .	Irregular fracture, extremely hard, dull, clean coal, with thin streaks of glossy coal.
100	38'30	15'10	51'20	20'20	1'30	Does not cake.	Ruddish white.	Very tough, dull, with bright patches.
50	37'00	10'00	60'40	20'20	3'20	Do.	Flesh colour .	Dull, with bright patches, easily broken, clean.
								Clean, rather bright, easily broken, with little dust.
400	37'50	27'20	60'10	23'20	2'20	Cakes slightly.	Dirty yellow .	Dull, breaks readily with irregular fracture, white substance, brown resin.
350	37'70	26'00	59'70	23'30	2'10	Do.	Flesh colour .	Similar to 700.
300	37'20	21'00	59'20	20'77	4'40	Does not cake.	Dirty white .	This shale is in layers. A resinous substance is found occasionally between the layers. Mineral oil by distillation, small. Yield of gas low, illuminating power deficient.
250	37'50	20'00	58'20	20'27	2'20	Do.	Light fawn .	Dull, grey black coal with soapy touch. Contains a small quantity of brown resinous matter. Mineral oil, very small, yield of gas very low, illuminating power small.
200	38'70	11'00	58'20	20'40	1'00	Cakes . .	Creamy brown	Easily broken, a quantity of a micaceous substance between the layers.

C. 1414-41.

COAL.		Report on the						
APPENDIX.		Results of Ultimate Analyses of Selected Indian Coals.						
Indian Invoice Number.	Province and Mine.	Carbon.	Hydrogen.	Ash.	Moisture.	Sulphur.	Heat Unit, Calories, etc.	
	Assam—							
1268	Makum . . . . .	77.31	5.43	1.97	3.99	1.70	11730	
96	Cherrapunji . . . . .	77.75	5.83	4.74	1.45	3.76	11110	
97	Mookong . . . . .	75.96	5.17	3.83	3.15	3.06	10730	
	BALUCHISTAN—							
93	Khwat . . . . .	71.36	4.99	5.57	3.96	4.70	9740	
94	Do. . . . .	70.58	5.25	10.64	3.61	0.74	10040	
	BENGAL—							
90	Kamardabhi . . . . .	70.43	4.70	13.85	1.86	0.33	11110	
	Kachhar—							
639	Lower Bann . . . . .	80.75	4.30	7.37	1.13	0.61	11110	
641	Upper „ . . . . .	85.53	4.90	5.25	1.16	0.40	11110	
1038	Bodajer . . . . .	73.09	4.97	9.03	3.34	0.30	10710	
1060	Laladai . . . . .	74.33	4.60	9.70	1.81	0.31	11110	
	MORNA—							
2531	Letchibhi . . . . .	60.15	4.64	9.16	11.53	0.31	11710	
	CENTRAL PROVINCES—							
1061	Mohpani . . . . .	67.63	4.37	9.73	7.91	0.43	10710	

TABLE III.

## Previous Analyses of Indian Coal.

Previous  
Analyses.

Province and Mine.	Calorific Value.	Fixed Carbon.	Ash.	Coke.	Volatile Matter.	Sulphur.	Reference.
Assam—							
Cherrapunji . . . . .	—	66.0	0.9	61.9	37.1	—	J. Prinsp.
Lengra Coal-field, Khelat, Hills—							
Section No. 1 . . . . .	—	50.00	8.60	39.00	41.0	—	T. D. La Touche, Coal Survey, Re. XVI, 1914.
„ No. 2 . . . . .	—	50.80	6.00	37.4	47.6	—	

C. 1414-47.

## Coal Supply of India.

## COAL.

TABLE III.—*contd.*

## APPENDIX.

Previous  
Analyses.

Produce and Mine.	Caloric Value.	Fixed Carbon.	Ash.	Clk.	Volatile Matter.	Sulphur.	Remarks.
<b>Assam—contd.</b>							
<b>Dumagat Hill—</b>							
No. 1 . . . . .	—	67.7	7.7	55.4	44.6	—	T. De la Touche, Rec. Geol. Surv., Vol. XV., Part 2, 1882.
" 2 . . . . .	—	51.6	9.6	54.4	45.6	—	
" 3 . . . . .	—	47.0	11.6	75.6	24.4	—	
" 4 . . . . .	—	14.0	51.6	68.8	31.2	—	
" 5 . . . . .	—	27.4	29.6	52.0	48.0	—	
<b>Mandag, Khola Hill—</b>							
No. 1, Dudam Hill . . . . .	—	32.8	31.6	60.4	39.6	—	F. R. Mallet, Proc. Geol. Surv., VIII., 1873.
" 2, Maobakha . . . . .	—	55.2	1.8	57.0	43.0	—	
Makum . . . . .	—	53.0	1.0	58.0	42.5	—	Hand-book, p. 34 (The Light and Coal Company).
Makum (average) . . . . .	—	75.70	1.13	98.8	21.18	—	F. R. Mallet, 1870.
Average of 27 analyses of Assam coal.	—	80.0	3.8	63.8	36.2	—	Ball's Geology.
Chitragang, A. . . . .	—	36.5	15.5	61.0	39.0	—	
" B. . . . .	—	15.9	38.3	64.9	35.1	—	T. H. Ward, Hand-book.
Assam coal . . . . .	13.70	53.45	1.60	55.68	44.32	8.32	
<b>Batubulan—</b>							
Khot Colliery . . . . .	—	46	1	50	50	—	Hand-book.
<b>Buxar—</b>							
Baighat (average of 31) . . . . .	—	53.0	10.13	70.07	30.03	—	Hand-book, P. N. Bose, 1890.
" (North Bengal Coal Company Upper Seam). . . . .	—	74.31	10.45	84.74	14.70	0.47	Dr. Salter, Hand-book.
" Alipore (average) . . . . .	18.80	60.80	14.62	75.40	24.60	1.36	T. H. Ward.
" (Barakar) . . . . .	—	64.26	7.27	71.53	28.47	1.56	T. H. Ward, Hand-book, page 5.
" (Dhanra) . . . . .	—	49.61	7.66	57.25	42.75	—	
" (Borwa) . . . . .	12.36	60.70	10.03	70.73	29.27	—	
" (Bairwa) . . . . .	12.40	55.70	9.59	65.29	34.71	—	
" (average of 16) . . . . .	—	51.08	16.17	67.35	32.65	—	Mem. Geol. Survey.
" (good specimen) . . . . .	—	51.80	10.70	68.50	31.50	—	

C. 1414-41.



# The Agricultural

## COAL.

## Report on the

## APPENDIX.

Previous  
Analysis.

TABLE III.—*contd.*

Province and Mine.	Calorific Value.	Fixed Carbon.	Ash.	Coal.	Volatile Matter.	Moisture.	Reference.
BENGAL—contd.							
Karharbari, Lower seam .	7320	85.40	9.15	75.90	84.90	0.45	Sales, Ball's Geology and Hand-book.
" " "	7180	87.51	11.00	79.10	80.80	0.70	
" " "	7320	84.97	9.35	74.00	85.80	0.84	
" Upper seam .	6944	80.46	11.90	75.45	87.80	0.50	
" Bhadoi seam .	6880	81.05	13.60	74.65	85.37	0.80	
" " "	6611	81.45	18.00	79.23	80.40	—	
" Khodidih seam .	6111	80.10	20.30	81.42	80.30	—	
" average .	7085	85.00	17.35	78.90	84.04	0.66	"
" (Dhirdih Coal, Bengal Coal Company).	80.50	80.30	14.10	74.40	85.50	—	Geol. Dept., 1891.
Karaspura (Damoda) .	—	84.5	8.5	75.0	89.0	—	Ball's Geology.
Auranga (Damoda) .	—	80.5	27.5	64.0	86.0	—	
Daitongan (Kool Valley) .	—	84.8	10.7	75.5	81.05	5.45	
" No. 1 .	—	80.44	48.50	88.90	81.90	—	T. De la Tour, Geol. Survey, Reports and Hand-book.
" " 1A .	—	80.78	31.30	70.10	89.90	—	
" " 2 .	—	80.34	80.78	85.18	10.20	—	
" " 4 .	—	44.80	15.10	61.00	80.40	—	
" " 9 .	—	54.84	18.10	80.34	33.00	—	
" (Palaman Coal-field, average) .	—	80.40	11.70	68.13	31.77	—	Sales, Hand-book.
Hetar (Kool Valley) .	—	85.30	10.7	68.05	33.05	—	Ball's Geology.
Durjooling (average of 8) .	—	80.30	17.41	70.98	28.94	—	P. N. Bose, Hand-book.
Tindaria (not worked) .	—	65.25	27.08	92.90	7.10	—	T. H. Ward, Hand-book.
Antagonon seam, Barakar rocks.	—	81.30	80.40	71.78	80.30	—	Ball's Geology.
Kairgon seam, Barakar rocks.	—	45.0	18.3	87.8	41.3	—	
BURMA—							
Murray Coal Company .	15.00	50.0	15.30	85.30	30.40	—	T. H. Ward, Hand-book.

C. 1414-41.

Coal Supply of India.

COAL.

TABLE III.—*contd.*

APPENDIX.

Previous  
Analyses.

Parties and Min.	Calorific Value.	Fixed Carbon.	Ash.	Vol.	Variable Matter.	Sulphur.	References.
<b>Burma—<i>contd.</i></b>							
<b>Shwepyithar (Burma Coal Company), seven outcrops.—</b>							
Lataw . . .	40'90	47'00	1'30	46'40	30'50	—	Hand-book, pp. 61, 62.
Katabia, No. 1 . . .	33'35	41'70	2'00	30'10	40'80	—	
" " 2 . . .	33'35	31'35	30'00	60'40	30'30	—	
Latabia, No. 1 . . .	30'35	30'30	14'10	30'30	40'60	—	
" " 2 . . .	43'20	34'10	33'30	30'60	43'40	—	
Chadok . . .	40'10	34'30	25'30	30'30	40'00	—	
Kabang . . .	30'00	33'30	21'70	37'30	43'40	—	
Latabia seam, top coal . . .	—	48'60	7'10	53'70	45'30	—	
" " bottom coal . . .	—	35'80	14'00	33'70	40'17	—	
Katabia outcrop, top coal . . .	—	44'30	7'45	51'05	45'35	—	
Katabia outcrop, bottom coal . . .	—	35'05	14'15	30'30	40'15	—	
Kabang . . .	—	30'30	33'00	60'70	30'35	—	Hand-book, p. 65. T. W. Hughes.
Latabia . . .	—	30'10	33'50	38'00	41'00	—	
Upper Chindwin (average of 11). . .	—	49'05	5'30	55'35	44'70	—	
Mogel, Great Tanna- conia River. { A. . . 30'30 13'30 14'70 45'30 B. . . 43'50 19'50 61'80 38'10 C. . . 43'27 8'00 31'30 47'70							
Kab Creek Coal, Chindwin Valley . . .	—	30'30	3'11	61'40	37'00	—	D. Hooper, 1889. Review of Mineral Production, 1896.
Latabia . . .	—	35'71	3'48	50'10	40'51	—	
<b>CENTRAL INDIA—</b>							
Umata (1884) . . .	—	71'77	18'03	87'80	12'20	Trace.	Hand-book.
" " . . .	—	66'71	8'13	74'83	25'19	—	T. H. Ward.
<b>CENTRAL PROVINCES—</b>							
Neopent . . .	—	64 to 70	10 to 15	74 to 85	18 to 23	1'00	Hand-book.
Wanar, large coal . . .	—	45'5	14'4	60'0	40'0	—	
" " thick coal . . .	—	38'5	24'0	30'5	40'4	—	

C. 1414-41.

# *The Agricultural Ledger.*

## **COAL.**

## **Report on the Coal Supply of India.**

**APPENDIX.**  
**Previous Analysis.**

**TABLE III.—*contd.***

Province and Mine.	Caloric Value.	Fixed Carbon.	Ash.	Coke.	Volatile Matter.	Sulphur.	Reference.
CENTRAL PROVINCES— <i>contd.</i>							
Warren . . . . .	—	45.6	14.3	30.6	40.4	—	} Ball's Geology.
Ghagha (average of 16) . . . . .	—	45.01	20.90	60.52	32.40	—	
Warren (average) . . . . .	—	43.20	8.90	51.20	48.10	0.20	Hand-book.
Pingoon . . . . .	—	45.1	15.7	30.8	19.3	—	Ball's Geology.
Johila (1881), not worked . . . . .	—	39.05	12.35	71.90	20.90	—	Hand-book.
NEPAL'S DOMINIONS—							
Singawal, A. . . . .	—	65.4	15.00	77.4	27.6	—	
" B. . . . .	—	60.0	11.00	77.0	25.0	—	
" " . . . . .	—	50.0	13.00	68.0	33.0	—	
" " . . . . .	—	58.0	10.14	—	25.10	1.50	
PANJAB—							
Quetta coal (North-West Frontier). . . . .	—	51.20	4.40	55.00	48.00	—	Hand-book.

## *Typical British Coals.*

**TYPICAL  
BRITISH  
COALS.**

Province and Mine.	Caloric Value.	Fixed Carbon.	Ash.	Coke.	Volatile Matter.	Sulphur.	Reference.
Welsh coal . . . . .	Average cal. val. 67,000 cal.	83.00	3.00	30.34	15.00	1.20	Official report on coal for navy.
Newcastle . . . . .		65.10	3.40	64.74	35.20	1.07	Indian Hand-book.
Bristol Lower Series (Steam). . . . .		69.35	6.16	75.51	34.00	1.20	Sales, Ball's Geology.
Bristol Upper Series (Gas). . . . .		60.07	5.60	60.97	35.73	1.20	

**C. 1414-41.**

G. I. C. P. O.—No. 235—B. & A.—12-9-98—2225—G. R.

**All communications regarding THE AGRICULTURAL LEDGER should be addressed to the Editor, Dr. George Watt, Reporter on Economic Products to the Government of India, Calcutta.**

**The objects of this publication (as already stated) are to gradually develop and perfect our knowledge of Indian Agricultural and Economic questions. Contributions or corrections and additions will therefore be most welcome.**

**In order to preserve a necessary relation to the various Departments of Government, contributions will be classified and numbered under certain series. Thus, for example, papers on Veterinary subjects will be registered under the Veterinary Series; those on Forestry in the Forest Series. Papers of more direct Agricultural or Industrial interest will be grouped according as the products dealt with belong to the Vegetable or Animal Kingdom. In a like manner, contributions on Mineral and Metallic subjects will be registered under the Mineral Series.**

---

**This sheet and the title-page may be removed when the subject-matter is filed in its proper place, according to the letter and number shown at the bottom of each page.**

## NOTICE.

---

Future issues of this publication placed under either the "Special Veterinary" or "Special Forest Series" will not be included in the annual enumeration. Such papers are printed for Departmental purposes. Their unfortunate inclusion in the system of annual numbering has led recipients of the ordinary issues to think their sets incomplete.

The following pamphlets have already appeared as Special issues, and have not accordingly been furnished to the public :—

1894	•	Nos. 8, 9, 10, 11, 13 and 15.
1896	•	No. 8.

